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ONE SUMMER'S LESSONS

IN

PRACTICAL PERSPECTIVE

BY

CHRISTINE CHAPLIN BRUSH

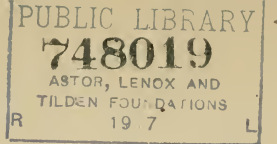
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ROBERTS BROTHERS

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BY ROBERTS BROTHERS

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JOHN WILSON AND SON, CAMBRIDGE

THIS little book is intended for the use of beginners, in connection with object-drawing.

If any of its readers encounter difficulties not sufficiently explained in the text, the writer will be pleased to answer by mail any questions they may send to her, through the publishers.

JULY, 1890.

ONE SUMMER'S LESSONS

IN

PRACTICAL PERSPECTIVE.



CHAPTER I.

THE stage left me at Captain Peter Stowell's house, where I was to pass my summer vacation. Uncle Peter and Aunt Mercy (as mine host and his good wife were called in town) hastened to the door, and greeted me as cordially as if I had been an old friend, whereas we had never met before.

"I do hope you won't be disappointed in me," said the old woman, smiling, as she ushered me into the parlor, "I never took a boarder in my life, but your friend wrote me that you was so set on comin', that I had to say 'yes.' "

"You hev took a boarder before," said Uncle Peter, with a merry twinkle in his eye ; "you 've boarded me nigh onter forty year, an' I aint never been disappointed in yer yit."

After tea, which Aunt Mercy served in the little parlor, I unpacked my trunk. My beloved sketches and studies I pinned about the parlor wall, to relieve the primness of the room and to give it a home-like air; and then, before nine o'clock, I was sleeping peacefully under the album quilt that adorned the "best bed," and that read like a chapter in Chronicles.

I had arranged to have my meals by myself, in the little parlor from which my bedroom opened, not fancying the hours of my landlord and his wife, who breakfasted at four o'clock in the morning, — before he went fishing, — and took tea at four o'clock in the afternoon.

The next morning, when I came out of my room, I saw a little girl about twelve years old, in a pink dress and a blue calico apron, standing lost in wonder before a study of scarlet poppies. She told me that her name was Letty, and that she lived with Aunt Mercy, who had sent her to dust the parlor before she brought in my breakfast; and then she asked shyly, "Did you make these pictures?"

"Yes," said I; "and brought them with me for company. Do you like pictures?"

"I never saw any real nice ones before, that looked like truly flowers," she said; "I've

often tried to draw by myself, and to paint too; but the colors in my box wouldn't come off very well. My mother is dead; she was born in that house across the road, so I thought I'd like to have a picture of it. I made one, but I guess it's all wrong."

"You must let me see it sometime," said I. Letty, with artistic instinct, drew the little breakfast-table close to the west window, where I could catch glimpses of the sea beyond the corn-fields. Humming-birds were hanging from the slender stalks of the "Butter-and-eggs" that grew thick about the house; and the breath of the brier-rose sweetened the room.

When the little girl called me to dinner, I saw her hiding a paper behind her.

"Is that the picture you told me about?" I asked. "Let me see it! Why, Letty, that's very well done for the work of a little girl who has had no instruction in drawing. Would you like to learn to draw correctly?"

"Oh, yes; but Auntie would think I was wasting my time. I never showed her this," said Letty.

Thinking that it would be a pleasure to teach this child, who seemed to have so sincere a desire to learn, and whose eyes had not been wearied over "drawing cards" and meaning-

less pages of straight and curved lines, I had a talk with Aunt Mercy on the subject, and fairly "brought her round;" and the very next afternoon Letty came to me for a lesson.

"The seashore will be our schoolhouse," I said; "and we need neither pencil nor paper to-day."

Away we went over the mullein-pastures and through the marsh-meadow to the long stretch of beach, where we seated ourselves, with high rocks towering above us.

"Now listen, Letty," I said; "I am to begin our lesson. You know that the world is round like a ball, and is poised in space, or as you would say, is 'hung in the air.' If we lived off on a star at a very great distance from the earth, we could see the great round world in space before us. Then if we flew from the star toward this place that we are now on, it would gradually stretch out before us like a vast plain covered with woods, fields, and water. Then as we approached nearer, houses and smaller objects would be seen more and more distinctly, until at last, when we stepped upon the earth, we should see just so much of it as you and I see now. We are such tiny specks on the surface of this great ball; we are so near the ground, the eyes of the tallest persons not

being more than six feet above it, that we can see only a short distance before us, — that is, only a little way over the ball.”

“I wish I could fly off even a little way,” said Letty, “and have a look at the earth, or at part of it.”



FIG. I.

“You shall in a moment,” said I; “but first tell me what you see from this point. Stand here and look off on the sea. You notice in the distance a dark blue line, that

seems to divide the sea from the sky. Which do you see the most of, the sky or the sea?"

"Oh, of the sky; the sea is only a narrow strip," said Letty. (Fig. 1.)

"Now fly up on the nearest rock, and tell me if you can see any more of the sea," I said.

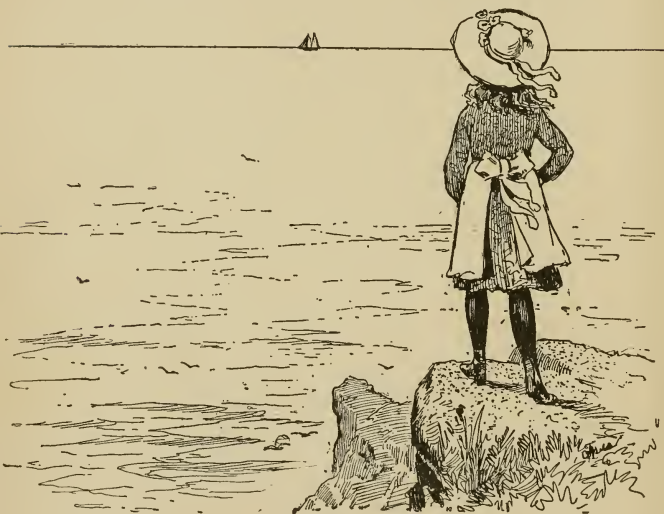


FIG. 2.

"A great deal more; but not so much of the sky," cried Letty.

"Fly onto the highest rock, and tell me how things look from that stand-point."

“ Oh, the sea is very wide; there is more sea than sky now,” cried Letty, when she had reached the summit. “ What does happen? Does the sea rise higher and higher?” (Fig. 2.)

“ No; you are the one who ‘ rises higher and higher.’ That blue line between the sky and sea is called the horizon. You know there is really no such line, because the sky and the sea do not meet in the distance any more than they do where we are. You saw more sea as you stood on the rock, because your eye was higher above this round earth than when you were on the beach. If you had gone higher yet, by climbing the tall pine-tree on the bluff, you would have seen still more of the sea which lies on the surface of this great ball.

“ There is also another reason for the sea looking wider as you rise, — a reason that you will understand by and by. Did you ever notice that a man in going down the long, steep hill which leads to the village, disappears, little by little, from view, — his feet first, then his body, and at last his head? ”

“ Oh, yes; I’ve noticed that. And when Uncle Peter comes back from the village, we see his old hat come up the hill first, then his shoulders, and at last his feet. Oh, dear, I wish

I could see somebody coming up and going down the hill of the earth," said Letty.

"You can," said I, "only that 'the somebody' is a ship. There is a black speck off on the ocean now; it is the mast of a ship. Now run up on the highest rock again, and tell me if you can see more of the vessel there."

"Yes; it is a larger speck here," cried Letty.

We waited patiently till the whole ship came in sight, for, luckily for us, the wind was blowing her toward the shore. Gradually we caught sight of the sails and hull. Fortunately another ship was sailing out to sea. The hull, or body, disappeared first, — "like Uncle Peter's old boots when he goes down hill," said Letty. As the masts vanished, she laughed. "There goes his old straw-hat, at last."

"Run up again to the highest rock. Can you see the ship still?" I asked.

"Yes; I can see farther over the world than you can, down on the shore. A vessel cannot be seen after it has gone over the horizon, can it?" asked Letty, returning to me.

"No; for the Horizon Line divides that part of the ocean which you can see, from that which you cannot see. The outgoing ship passed beyond my Horizon Line as I sat on the beach, before

it passed beyond your Horizon Line as you stood on the high rock above me. As the Horizon Line is not a real, stationary line, it appears to ascend or descend with us. Hold your pencil close to and across your open eyes, horizontally, as it is called. Look above it, and you see only sky; look below it, and you see only sea. You cannot see the Horizon Line at all because the pencil hides it from your eyes. Go up to the rock, and try this experiment at every few steps. You will notice that wherever you stand, the Horizon Line always appears to be on a level with your eye, rising as you rise."

"How much you say 'seem' and 'appear,'" said Letty.

"Yes; for we are to make pictures of objects by and by, and very few objects can be drawn as they really are. Thickness and distance cannot be actually represented on a flat surface like paper; so we must draw the objects, not as they are, but as they appear to be to us."

Then we went back through the mullein-pasture and the marsh-meadow, and let down the bars for "old Mooley," who was calling for her supper. I overheard Letty telling her uncle about her lesson.

"Pho!" cried the old man, "I know all about that. Many and many a time I've been up aloft,

and spied the whole of a vessel, when we could only see the top of her mast from the deck. I should think the lady had spent her time a-goin' to sea. But I don't see what that's got to do with drawin' picters."

CHAPTER II.

“THE Horizon Line is straight in this picture,” said Letty, bringing an open book to me; “it ought to be curved a little. The Horizon Line is a circle, and even the least little bit of it ought to be curved.”

Aunt Mercy had given up the shed-kitchen to our use, and I was now seated there for our second lesson.

“Listen, Letty,” said I, “only a very small part of the Horizon Line can be seen distinctly enough to be drawn, and that small portion always appears straight, as I will soon prove to you.

“If you could be placed on the surface of the ocean, exactly in the middle of the great circle of the horizon, you would find that the little portion of it that you could see well enough to trace on a pane of glass placed before you, would be a perfectly straight, horizontal line. (Fig. 3.) I will divide this large chalk-circle, which I have drawn on the floor, into small parts or sections. Notice, now, Letty, that the

little bit of the circle which represents the horizon in the smallest section looks straight. In this larger section you notice the curve. The large section represents that slightly curved Horizon Line which you see when you look out on the ocean; the small section, that portion of the Horizon Line which you see distinctly enough to draw, and which appears straight.

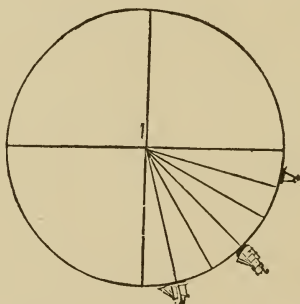


FIG. 3.

“Suppose from your position in the centre of the circle of the horizon, you traced on the pane of glass a schooner directly in front of you on the horizon. Then you decide to draw a ship at your extreme left also; but in order to see it clearly enough to draw it, you will have to turn your head a little to the left. By turning your head enough to draw the ship,

you catch sight of a boat still farther to the left. Turning a little more, to see *that* distinctly, you lose sight altogether of the schooner which was at first directly in front of your eye. So you see that every time you turn your head you change your position, just as much as if you turned your body with it. How foolish it would be in a man to walk while he sketched. You would say, 'Why does n't he stay in one place till he has finished one sketch, and then go to the right, or left, and make another?'

"Turning the head changes the view just as much as walking does. If you should stand in one of the little bath-houses on the beach, in the door of which a round window had been placed, you could see a portion of the ocean in front of you. You' could not see much at either your right or the left hand, because you could not see through the sides of the bath-house. If I should remove you — bath-house and all — farther along on the beach, you would still see the ocean before you, but not the same part of it. If you had seen a sail-boat in the first position, you would have lost it in the second; and perhaps have gained a ship, or the light-house on the point. If you should trace a picture on your round window, you

would see that the Horizon Line in it would appear straight.

“Now, Letty, I cannot tell you at present much about the eye; but I will say now that the part of the eye with which we see, is placed in a little closet called the eye-ball, in which is a round window. The sides of this little

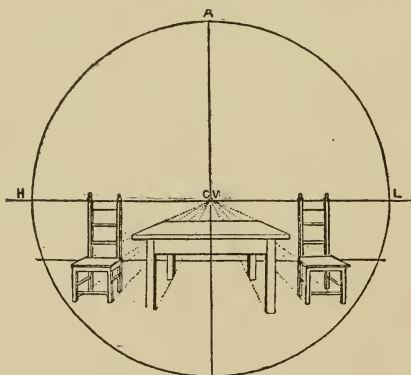


FIG. 4.

closet are not transparent, and you cannot see through them any more than you could see through the sides of the bath-house. You may turn your *eyes* while drawing as much as you please, but you must ‘play’ that you have a stiff neck and cannot turn it. If you wish to sketch an object at your right or

your left, you must move yourself along, as I 'supposed' I moved you in the bath-house; but remember never to change your position till you are ready to begin a new sketch. (Fig. 4.)

"You may think now that you see the things on the opposite side of the room well enough to draw them all. Directly opposite to you, against the wall, is a table; on the left of the table is a chair, and beyond that Aunt Mercy's arm-chair; at the right of the table is a chair, beyond that a window. I will now take your seat, and draw as many of these objects as I can see without turning my head, — the table in the middle and the chair on the left —"

"You have turned your head!" cried Letty, as I began to draw Aunt Mercy's chair.

"I must leave that out of this picture, then," said I. "I will draw the chair on the right of the table and then the window."

"Oh!" cried Letty, watching me closely, "you turned your head again!"

"Good-by to the window, then," said I. "Notice the almanac which hangs over the table. Can I see that without raising my head?"

"No, ma'am."

"Can I see this chalk-mark before me on the floor, without bending my head down?"

"No, ma'am."

"Then both almanac and chalk-mark must be thrown out of my picture too. We have now found that we can see only a certain distance above and below, to the right and to the left, without turning the head. What will be the shape of this picture, — square or round?"

"Square, I suppose," replied Letty; "most pictures are."

"Do you not forget that your eye is looking out of a round window?"

"Oh, now I remember," cried Letty, "the splendid little round pictures I saw through the port-holes in the sloop cabin when we were coming home from Nantucket, and the sun was shining on the windows in the village. My eye is looking through a port-hole in the eye-ball now, is n't it?"

"I have drawn some lines in this picture which you cannot understand yet. Look only at the chairs and table now. There is a point in the middle of all that we can see at one time, a point directly opposite the eye. You remember that the Horizon Line always appears to be on a level with the eye; and this point I am speaking of is directly opposite the eye. So, of course, it must be on the Horizon Line."

"Yes," replied Letty, sadly; "but where is the horizon line on this old kitchen wall? We can't see where the sky and sea meet through the boards."

"The point opposite my eye," I said, "is found by holding a pencil at arm's length horizontally, keeping the unsharpened end toward me, and as nearly on a level with my eye as possible. I have closed one eye, you see. If I hold the pencil even a little below my eye, I see the whole length of it, as also I do if I hold the pencil a little above it. If I place it to the right, I see its left side; if to the left, its right side. But if I get it exactly opposite my eye, I can see nothing of it but the unsharpened end, which covers from my eye a tiny bit of the object directly before me."

"Why do you close one eye?" asked Letty.

"I will tell you by and by. Close one of your eyes, and tell me what the round pencil-end covers from your sight."

"It covers the middle of that knot in the wall!" she cried.

"That point, then, in the middle of the knot is named the 'Centre of View;' can you tell me why?"

Letty thought aloud. "'Centre' means middle. 'View' means what I can see, — the

middle of what I can see. That is a very nice name! ”

“ As the Horizon Line is always on a level with the eye,” I said, “ and the Centre of View is always directly opposite the eye, the Centre of View must always lie on the Horizon Line. If, therefore, I first find the Centre of View, I can from that always find the Horizon Line.”

I then drew a chalk-line (which I marked at each end “ Horizon Line”) across the kitchen wall, through the knot in the board, which I marked “ Centre of View.”

“ If the wall of this kitchen were glass,” said Letty, “ and I could look through it and see the blue Horizon Line, would a little spot on the glass just where the knot is, cover a bit of the Horizon Line from my eye? ”

“ It certainly would,” I replied.

“ Why, it is splendid,” exclaimed Letty, “ to know how to find the Horizon Line when you can't see it, is n't it? ”

Sometime after our lesson was ended, Letty came running back, almost breathless, from the beach.

“ It's all true,” she cried. “ I just went down to see if I could find the Centre of View on the true Horizon Line; I did every time! The unsharpened end of the pencil looked just as if it

were sitting off on the blue line, miles and miles away ! ”

Here Uncle Peter stepped into the shed and looked at the lines and letters with great respect ; and said he “ never knew there was so much to drawin’ before.”

CHAPTER III.

“NOW, I will tell you something about planes and lines.

“First, a plane is a smooth, level surface. Show me the planes in this room.”

“The floor, the ceiling, the walls, the chair-seats, the top of the table and of the stove,” said Letty.

“There are several kinds of planes and lines, which have names to distinguish them, just as the colors have names to distinguish them. The floor and ceiling are called Horizontal Planes. Upright Planes like the walls and doors are called Vertical Planes. Parallel Planes are planes which are equally distant from each other throughout their whole extent. Thus, the wall I stand against is parallel with the wall opposite to me. The side-walls are parallel to each other. The chair-seats are parallel to the floor, and the floor to the ceiling.”

Letty went over all this till she thoroughly understood it. “But,” said she, “the side-walls are not parallel to the back and front walls.”

“No; this back and side wall form a right angle,” said I. “If I had hinges on the corner where these two walls meet, I could draw them together, or push them apart. If I did so, the table, the sides of which form a right angle, would not fit into the corner as it does now.”

“Can’t you explain this to me a little more?” asked Letty.

“I will try. This chalk-circle that I have drawn on the floor represents the circle of the horizon. (Refer to Fig. 3.) It is supposed to be divided into three hundred and sixty little sections, or degrees, as they are properly called. If I divide the circle into quarters, how many degrees would there be in each quarter?”

“Ninety!” cried Letty, who was at the head of the arithmetic class at school.

“If I spread two of these lines farther apart, they would take in more than ninety degrees of the horizon; if I drew them closer together, they would take in less than ninety degrees.”

“Just as you told me about the walls!” cried Letty, catching the idea. “See, I can fit a book right in between these two lines.”

“So an angle is a right angle when its boundary lines are spread just far enough apart to take in a quarter of a circle. The top of the stove, for instance, is at right angles with its

sides; and the walls of the room are at right angles with the floor and ceiling.

"Now a word for lines. The edges of planes are called lines. These are horizontal lines where the floors and ceilings touch the walls, and the cracks in the floor-boards are horizontal lines, because they lie in a horizontal plane."

"And the corner lines of the walls are vertical lines," added Letty.

I chalked these different lines on the kitchen walls, and marked them with the initials of their names.

"Now I must teach you to find 'apparent measurements,' as they are called," I said. "Close your left eye,—or your right if you choose,—and hold your pencil perpendicularly, and at arm's length."

"Is that to keep it steady?" asked the little girl.

"Yes; and also that each measurement may be made at an equal distance from the eye. Let the unsharpened end of your pencil appear to touch the upper horizontal line of the window. Place your thumb on the pencil, where the line of the window-seat seems to come."

"Is n't that funny!" cried Letty, opening her eye and holding up the pencil. "That great long window only seems *that* long."

I took the measurement from her pencil, and

marked it off on the wall. She measured the width of the window in the same way, this time, of course, holding her pencil horizontally. I laid that measurement off at right angles with the length-line.

The window was between two beams, and was four feet high and two feet wide, by Aunt Mercy's yard-stick. Its height was therefore twice its width. Letty was delighted to find that the length-line that I had laid off on the wall was also twice as long as the width-line. I added the two lines necessary to form a window-frame, and drew the sashes.

"This drawing, Letty," said I, "is a portrait of that window, in perfect proportion." (Fig. 5.)

She then measured other objects about the room in the same way.

"The nearer you are to an object," I said, "the larger the measurement will be, of course. You see now how you will find the proportions of a building, when you begin to draw."

"Must I always draw an object just the size it measures on the pencil?" asked Letty.



FIG. 5.

"Oh, no. You get the 'proportion,' as it is

called, in that way; you may make the lines of the drawing larger or smaller."

I now drew on the wall, near the drawing of the window that Letty had measured, one smaller, and another three times its size, to show her what I meant by "proportion;" in each drawing, the height was twice its width.

"Why must I close one eye?" she asked again.

"Fix your eyes on an object, — the knob of the closet-door for instance, — and then hold your finger between it and your eyes. Do you not see two fingers?"

"Yes," said Letty, in great surprise.

"Fix your eyes on your finger; do you not see two knobs beyond it?"

"Yes," she said. "What is the matter?"

"I cannot explain to you at present about the formation of the eye, and 'vision'. I only called your attention to this, to show you why you must close one eye in getting measurements. If you look with both eyes at the object to be measured, you will be troubled by the appearance of two pencils, and if you fix your eyes on the pencil you will be troubled by the appearance of two objects; therefore you must close one eye."

“Why,” said Letty, looking at the knob, and then suddenly at her finger, “I feel something in my eyes sort of change!”

“Yes,” I said; “if the eyes are adjusted, or fitted, to view a distant object, they must be rapidly re-adjusted to look at a much nearer one.”

“Oh,” cried Letty, “I really feel my eyes go in and out, like Uncle Peter’s old spy-glass.”

At dinner that day, when Aunt Mercy had divided the cherry-pie into quarters, and passed them round on her pretty dark-blue plates, Letty startled us by exclaiming, —

“Why, we are all eating angles of ninety degrees!”

“It tastes a good deal like pie,” said Uncle Peter, puckering up his mouth till we all laughed. “You’re so larned, Letty, you’ll be callin’ your Aunt Mercy and me human bein’s next ’stead of ‘folks.’”

CHAPTER IV.

THE next day, Letty and I met again in the old shed-kitchen. The chalk Horizon Line on the wall was still distinct, drawn through the knot which I had marked, Centre of View. I now placed a large packing-box directly under the Centre of View, where the table had been in Fig. 4, so that she could only see the top and front of it. She was seated from it four or five times its height. I placed before her, on a small table, a large framed glass, which I held steadily in an upright

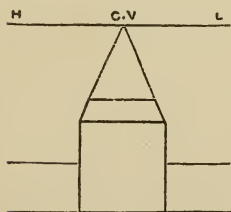


FIG. 6. — I.

position. Letty held in her hand a small paint-brush filled with an opaque water-color paint, Chinese white.

“Close one eye, now,” I said, “look through the glass, and trace on it, as steadily as you can, the

chalk Horizon Line on the wall, and dot the point where the Centre of View comes, on the knot. I want to show you how to make a drawing of

an object. Trace the outlines of the box, also the crack in the floor which lies along the front edge of the box." (Fig. 6. — 1.)

"What a strange drawing," cried Letty. "The upper lines of the sides of the box, which are really parallel to each other, seem to grow nearer and nearer together, toward the back of the box."

"Continue the lines of the sides now, beyond the box, and see if they will appear to meet anywhere."

"Yes; at the Centre of View," cried Letty.

"Those lines, then, are drawn as they appear, and not as they are, you see. How does the front face, or surface of the box look?"

Letty measured the lines she had traced. "It is square, — just the same as the real box."

"The front face, then, is drawn as it really is. The horizontal line of the back of the box, and the upper line of the front, really measure alike; but the back line is much shorter in the drawing, because the side lines, which appear to incline together, cut it off.

"Where an object stands below the Horizon Line, when as it extends away from you into the distance, it appears to rise higher and higher toward the Horizon Line. You see the back line of the top appears on the glass to be

higher, as well as shorter, than the front line which corresponds to it.

"Now I will place the box a little to the right of you, that you may see a side plane, as well as a top and front plane."

"The front face still looks square," said Letty; "but the lines that bound the side plane are so queer! They *will* run all to the left, toward the Centre of View (Fig. 6. — 2), and if I extend them beyond the box, they will meet there."

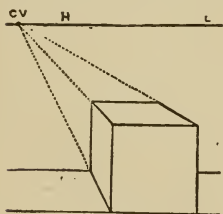


FIG. 6. — 2.

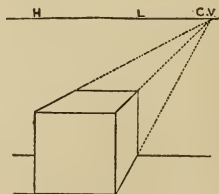


FIG. 6. — 3.

I now moved the box as far to the left as I had before moved it to the right of the Centre of View.

"The front face is still square," said Letty; "but the boundary lines of the side plane have all turned toward the right now, and run toward, and would meet at, the Centre of View, if I extended them beyond the box. They seem to like the Centre of View very much." (Fig. 6. — 3.)

“Now,” asked Letty, “why do these lines ‘act so’?”

As we discovered the reasons, Letty set them down in her book in her own words, thus: —

“When a plane, or surface, of an object is parallel to me, all the boundary lines of that plane may be drawn just as they really are.

“The front face of the box was parallel to me in the three positions in which the box was placed, so I made it alike in the three drawings.

“The boundary lines of planes that are at right angles with me seem to run toward the Centre of View and would meet there, if I made them long enough.”

“It is always so with lines that form right angles with the person drawing,” said I.

“It is strange,” said Letty, “that the top of the box and the sides look so much narrower than the front face, when they measure the same.”

“If you stand up, Letty,” said I, “you will see much more of the top of the box than you will if you kneel; and the farther you go to the right or left of the box, the more you see of the right or left side.”

“I know that,” said Letty; “but the strange thing about it is, that whether the top or sides look narrow or wide, I always see the whole of them from back to front.”

I quickly stretched a piece of coarse white book-muslin over the frame, having first slipped the glass out. I borrowed a sail-needle and a long thread from Uncle Peter, who came and sat on the doorstep, and looked on with a very wise air. He felt at home in any circle to which sail-thread and needles were admitted.

Letty sat down again at the table, in the position from which she had drawn the box. (Fig. 6. — 1.) On the framed muslin before her I painted, in sepia, the Horizon Line, the Centre of View, and the outline of the box, — an exact copy of the tracing she had made of the box. (Fig. 6. — 1.) I then tacked threads to the four corners of the top of the box, and threading these, one at a time, I pierced the corresponding corners of the sepia drawing, on the framed muslin. Then gathering the ends of the threads together, I held them as near as possible to Letty's eye.

"These threads," I said, "represent the rays of light that enter your eye from the corners of the box. Rays come to your eye from every point of the box; but we need only to find the corner rays. Lines connecting them will form the outline, or boundary lines as we call them. You see the threads from the back corners of the top come between the threads from the front corners of the top.

“The eye not being much above the box, the threads from the back only incline slightly upward, to enter the eye. And so the space between the front and back threads is very trifling where they pierce the muslin, — not one third the real measurement of the top of the box, from front to back.

“But if you stand up, the back threads will incline more toward the vertical, in order to reach the eye; and though the front threads rise too, this makes a greater space between them where they pierce the muslin; if, indeed, the rays from the back horizontal line do not rise over the frame itself.

“If you kneel, to bring your eye only just above the top of the box, the threads from the back and front will be very nearly together, and the space between them will be extremely narrow. Now you see that the apparent width of a horizontal plane depends entirely on your height above it.

“Notice that the right-hand plane of the box will look wider if you move toward the right; because the rays are not then forced to run so near together to enter the eye.

“These same causes, again, make the surface of the ocean appear of different widths according to the height from which we see it. As you

sat on the beach the rays of light from the extreme distance came to your eye about horizontally; but from the standpoint on the rock, they came to you more nearly vertical.

“Now, do you not see that there would be less space between the rays from the near edge of the sea and the rays that came almost horizontally to your eye from the distance as you sat on the beach, than there would be between the rays from the near edge of the sea and the rays that came vertically to your eye from the distance, from your standpoint on the rock?”

Letty showed her book to her uncle and aunt that evening.

“Oh, dear!” she said to Uncle Peter, “how I do wish you had begun to draw this summer! We would then have had such splendid times together in the long winter evenings. Do you know that if I find where one line vanishes, all the other parallel lines run after it, like a flock of sheep. It’s as nice as a puzzle,—it’s very funny!”

“Checkers is funny enough for me,” said Uncle Peter, shaking his head doubtfully.

“Uncle Peter is splendid at checkers,” said Letty to me, proudly. “Nobody can beat him,—not even Deacon Stone, the committeeman.”

CHAPTER V.

“LETTY, you may sit down just where you sat before, to trace the box,” I said, “with the little table in front of you, and the framed glass upon it, on which the sketch of the box still remains. I will again hold the framed glass in an upright position for you.

“The floor, or ground, on which the objects that you are to draw are resting, is called the ‘Ground Plane.’ ”

“Anybody might have made up that name for it,” said Letty, rather scornfully. “I could have named ground, ‘ground’ myself.”

“You are sitting upon the same Ground Plane with your objects. You need not, however, draw all of the floor, or Ground Plane as we name it, that you see between you and them. You may decide how much of it you wish to take into your picture.

“The boundary (nearest to you) of that portion of the Ground Plane that you choose to draw is called the ‘Ground Line.’ That crack in the floor that lies along the front face of the

box in Fig. 6 is the Ground Line of the Ground Plane for that picture, Letty.

“Of course you understand that the Ground Plane extends off into the distance, till it seems to meet the Horizon Line, as we would see if we could look through the kitchen-wall.

“Now keep your wits clear, Letty. Upon this Ground Line that we have chosen, which extends off to the right and the left, imagine a great, transparent plane, an immense glass, standing upright and close against the front face of the box, ‘parallel to it.’”

“I know just how it would look,” said Letty, “and I am going to imagine it as large as the kitchen.”

“If I sat where you do, Letty, and with a long, long-handled brush traced a picture of the box on the ‘Picture Plane,’ as we will now call this imaginary plane, it would look exactly like the little picture you have traced on the framed glass, only much larger; for the front face of the drawing would be exactly the size of the front face of the real box.

“If I should place another transparent plane between the Picture Plane and the framed glass which I hold in front of you, the picture on that would be smaller than the one on the Picture Plane, and larger than the one on the framed glass.”

“Of course it would,” said Letty; “because you said the rays of light from the box come nearer together as they approach the eye. And if the rays could prick little holes in the planes that stand between the box and me, the pictures would get smaller the nearer the planes on which they were pricked stood to me.”

“That is right (Fig. 7). Now as we cannot

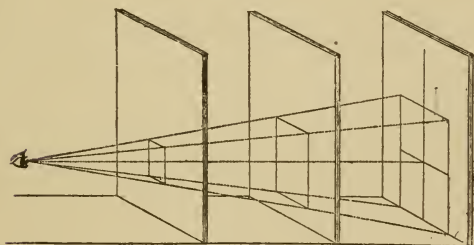


FIG. 7.

have a great Picture Plane on the Ground Line, we find the Centre of View (through which the Horizon Line runs) on some object, like the wall, for instance, or if we are out of doors, on a building or a tree.

“Then we imagine the Picture Plane standing upright on the Ground Line (which we decide on) with the Horizon Line and Centre of View traced on it.

“Therefore you understand that the outlines

of the object (which we see through the Picture Plane), if traced on a nearer plane, would be a tiny copy of that which we could trace on the big Picture Plane, had we one."

"I have enough to think about now for several days," said Letty; "and after that I shall have a great many questions to ask. I have one to ask you now, I believe. I'm puz-

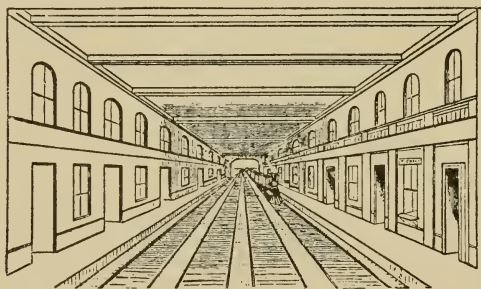


FIG. 8.

zled a little bit to know *why* the boundary lines of the box, which are at right angles to me, vanish at the Centre of View. I see they do."

"I think I can explain it to you, Letty. 'Once upon a time' somebody noticed that horizontal planes below the eye appeared to incline upward, and horizontal planes above the eye downward as they receded into the

distance; also that the vertical planes on the left and the right appeared to come nearer and nearer to one another as they extended away into the distance; and that if these four planes belonged to a hall, for instance, that was long enough, they would seem to meet in a point exactly opposite the eye. (Fig. 8.)

“Then this ‘somebody’ — or somebody else — noticed that the Horizon Line always appeared to be on a level with the eye; and that just as much could be seen at the right as at the left of the point directly opposite the eye, — the Centre of View, — which of course lay on the Horizon Line, and just as much above as below it.

“If I looked at that farthest left-hand point of the Horizon Line, which I could see without turning my head, and gradually moved my eye along the line till it rested on the farthest right-hand limit, I could say, ‘I had looked along a *horizontal* line.’

“If from the nearest point in front of me on the Ground Plane, that I could see without bending my head, I gradually moved my eye to the Centre of View, and on upward till I saw the highest point in the sky that I could see without raising my head, I could then say, ‘I had looked along a *vertical* line.’

“If I could mark this vertical line, I should

find, by measuring it, that it was just the length of that portion of the horizontal line that I saw without turning my head.

“If I should draw a circle that touched the four ends of this horizontal line and this vertical line, it would contain all that I could see at once, divided into four equal parts. (Fig. 9.)

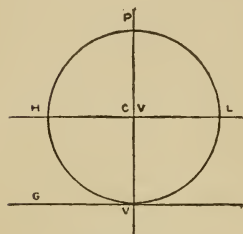


FIG. 9.

“Then I suppose this kind ‘somebody,’ who has thought this all out for us,

said, ‘If I had a great transparent plane standing in front of the object I wish to draw, I could trace on it the Horizon Line, the Centre of View, and the middle Vertical Line (which shall be named the Principal Vertical Line), and also a picture of the object.’

“Noticing also that only the nearest edges of planes on a level with the eye could be seen, he said, ‘I will imagine that horizontal and vertical planes running from my eye would cut horizontal and vertical lines right through the Picture Plane on their way into the distance. These lines would be named the Horizon Line and Principal Vertical Line after the planes they represent.’ (Fig. 10.)

“Let us go back a little, Letty. We see plainly that each boundary line of the box belongs to two planes. (See Fig. 6. — 2.)

“The upper boundary line of the vertical side plane of a box belongs no more to that vertical plane than it does to the horizontal plane of the top of the box. . It belongs to both planes. The horizontal plane, being below the level of the eye, appears to rise on its way toward the Horizon Plane (or the Horizon Line,

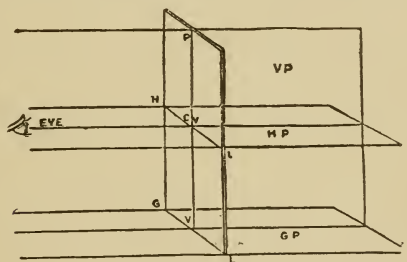


FIG. 10.

as we say, that being the edge of the Horizon Plane) and draws its boundary line with it.

“The Vertical Plane of the side appears to incline to the right, and draws this same line toward the Principal Vertical Line, as we say, that being the nearest edge of the Vertical Plane.

“This line, then, forced in two directions by

the two planes to which it belongs, will vanish, if continued, at the intersection of the two imaginary planes, parallel to these two planes (the top and right-hand planes) of the box."

"And this intersection is at the Centre of View," added Letty.

I drew a long, vertical line with chalk on the wall, upward to the almanac (see Fig. 4) and downward to the floor and then out to the chalk-mark on the floor; and then enclosed in a circle this vertical line (the continuation of which lay on the floor) and an equal portion of the chalk Horizon Line.

"I have drawn this line, Letty, to keep the imaginary Vertical Plane in mind. It will say to you, —

“ ‘ When this you see
Remember me.’ ”

CHAPTER VI.

“ I HAVE a great many more questions to ask you,” said Letty, coming to me with a puzzled air. “ You remember Figure 4, where I drew all I could see without turning my head ? If I wished to draw the chair, and the table to the right of it, *only*, what should I do ? I wish now to show more than half a table, and yet the Centre of View is right in the middle of it.”

“ Although the Centre of View is always the central point in all that you see,” said I, “ it is not necessary to have the Centre of View in the middle of your picture ; neither are you obliged to draw at one time all that it is possible for you to draw.

“ You drew in Figure 4 all that your eye could take in at the distance at which you sat from your objects ; but if you had moved farther away from them, you could have taken in other objects, — Aunt Mercy’s chair and the window, for instance.

“ Now pull the table that you wish to draw, to the right of the Centre of View, and place the

chair at the right of the table and increase a little the distance which you had in Figure 4, between you and those objects. If you sit very near the table you see no other object distinctly enough to draw; as you increase the distance between you and it, you will see the chairs; and if you make the distance still greater,

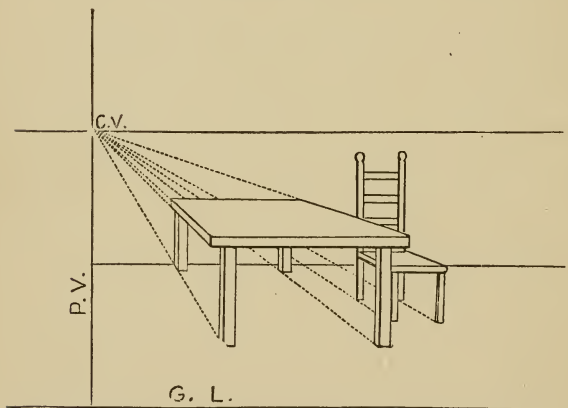


FIG. II.

you will include other objects. See, I have drawn the table and chair." (Fig. II.)

"Then I need not always make the picture round," said Letty.

"No; for you are not obliged to draw all you can see at one time. Cut off the curves,

if you please, and there is the picture bounded by horizontal and perpendicular lines."

"I think I understand all this," said the little girl.

Letty had copied all the chalk-lines from the kitchen-wall into her red book, with original comments on each. She had traced chairs, boxes, and bureaus on the framed glass, and houses and barns on the window-panes, and had copied these drawings also in her book.

"What is the matter with this box and chair?" asked the little girl, one day, bringing me some very odd-looking drawings. "They *must* be right, for I traced the outlines on the glass."

"They may be correct from the position in which you drew them," said I; "but you were too near to the objects, and your eye was so far above them as to make the picture look distorted. This is a good time for a lesson on the proper placing of objects.

"You might draw an object exactly as it appeared from a certain position, and yet give me no clear idea of its real form, because the position was not well chosen. (Fig. 12.)

"Now, I should judge from your drawing that the horizontal top of this box was an inclined plane, and that the box itself, instead of resting on a level surface, the floor, was poised on an

inclined plane from which it might slip at any moment. Do you think you could sit on that chair?" I asked, holding up another of her pictures.

"No," said Letty, laughing; "I should slide off."

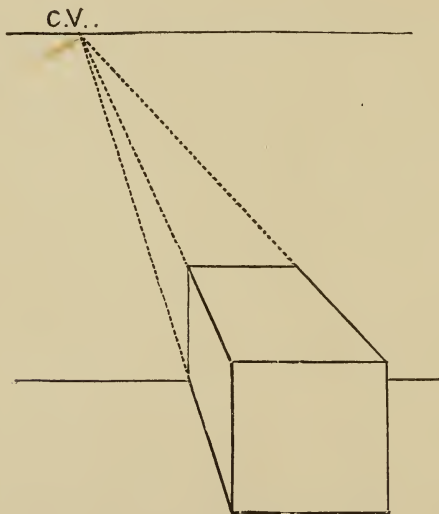


FIG. 12.

"Then again," said I, "you might have placed yourself so low that your eye would have been on a level with the rounds of the chair, but that position would have been no better than the one you did take."

“The level of the eye, when one is sitting, is generally a little above the back of an ordinary chair, and therefore you should place your eye at that level to draw it.”

“Did you not say that when drawing an object I must sit off about six times the width of it?”

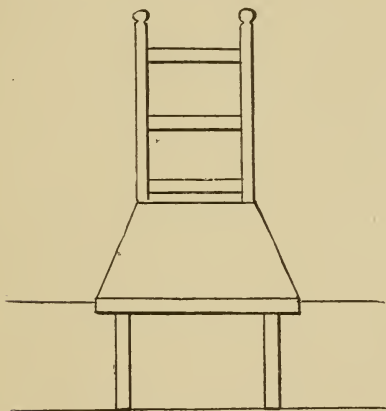


FIG. 13.

“I said so when you drew the box. But you can usually judge by looking at an object whether or not you are at a proper distance from it. You might, if you chose, place a chair so that the back legs could not be seen. You would know that the real chair had back legs, although you did not see them, as your experi-

ence teaches you that a chair with only two legs will not stand. But in representing it in that position upon the flat surface of the paper, it would look like a very remarkable chair standing on two legs, 'like anybody.' " (Fig. 13.)

"I understand," said Letty, laughing.

"If you stand on a hill to draw a house in a valley, the house chimneys will be below the level of your eye, and will look like this. (Fig. 14.)

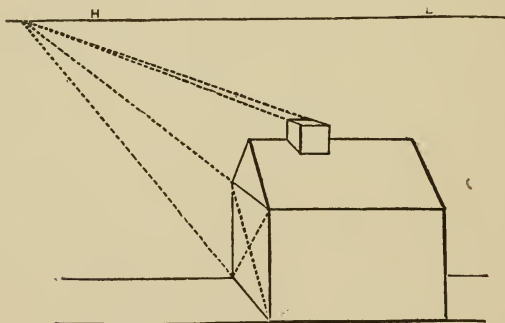


FIG. 14.

"It is very seldom, however, that we are placed where we can look into chimneys; the level of the eye usually lies half-way down the parallel face of the house, if you sit at a suitable distance from it."

"I think I understand that very well," said Letty.

"What is the matter here?" she asked, holding up another drawing of a chair. "I traced the outlines through the glass, but the boundary lines of the sides of the seat would not vanish at the Centre of View."

I looked at the chair itself, as she had placed it.

"Very wise lines, they were, Letty. They knew they did not belong to the Centre of View. The back of the seat is narrower than the front, and that front line itself is a curved line." (Fig. 15.)

"I see now," said Letty, blushing. "It is only lines that are at right angles to the Picture Plane, which vanish, if continued, at the Centre of View."

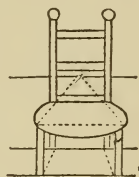


FIG. 15.

"Curved lines never appear to meet anywhere."

"Draw this chair now as if its sides were at right angles with a straight front line, and then add the curved line to the front of the seat, and judge of the direction of the curved side lines by your eye."

"Always remember too, when you are not tracing objects on the glass, to get the apparent measurements before beginning your picture, so that if you have several objects in it they may be in proportion to each other."

CHAPTER VII.

"I WILL draw a few objects for your red book, Letty," I said one day. (Fig. 16.)

"First, I will draw the door that opens back into the sitting-room, and is standing at right angles with its doorway, which is parallel to us."

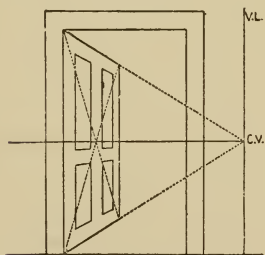


FIG. 16.

I found the Centre of View on the wall at the right of the doorway, on a line with the latch-catch which was half-way down the door frame.

I drew a horizontal line across the paper, and placed a point on it for a Centre of View. I drew a vertical line through the Centre of View to represent the Principal Vertical Line.

The upper and lower boundary lines of the door vanished at the Centre of View, and as these lines belonged to horizontal planes above

and below the level of the eye, they inclined respectively downward and upward.

"Is there any way of knowing how wide to make the vertical side planes of objects, except by apparent measurement?" asked Letty, as I measured off the width of the door on my pencil.

"Yes, there is another way; but it would puzzle your little head, now. Apparent measurements are enough for you while you are drawing from objects. If you wish to draw objects not before you, but of which you have the measurements, or if you wish to design pictures, the other way would be of great use."

On the door in the sketch, I drew two lines diagonally, at the intersection of which I drew a perpendicular line.

"You see, Letty," I said, "that the nearer half of the door looks wider than the farther half. The reason for this you know,—the more distant an object is from us, the closer the boundary rays are to each other, as they approach the eye, and thus appear to decrease the width of the planes they bound." I drew the panels on the door to show, more plainly still, how rapidly the plane of the door appeared to decrease in width as it receded from us.

I next drew the doorway again, this time in

a side plane, the door itself being parallel to the Picture Plane. (Fig. 17.)

"This picture only wants another side, a top, and a front, to make it a box, except that the one side we have is only a plane of air," said Letty, bent on discoveries.

"It is a good thought," said I, "to carry the idea of a box as far as possible through the objects you draw. A bureau is a box; so is a

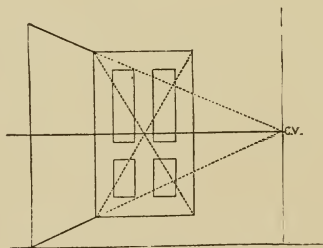


FIG. 17.

drawer, and even a room, a house, and a barn, and all objects, in fact, that are composed of planes at right angles."

"Please to draw a bureau for me, and leave one drawer open," said Letty.

We went to the front chamber and drew Aunt Mercy's bureau.

"You'll get puzzled here," I said, "unless you keep in mind that lines at right angles with

the Picture Plane, all vanish at the Centre of View. Or you could say that lines at right angles to the front of the bureau, or to me in my present position, meet at the Centre of View, as the front of the bureau and I and the imaginary Picture Plane are all parallel planes." (Fig. 18.)

"Oh!" cried Letty, suddenly, "I want to know how to draw barrels!"

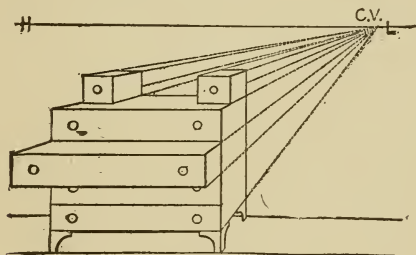


FIG. 18.

We went into the barn and experimented a little.

"If your eye is on a level with the middle of the barrel, the curved line of the top inclines downward toward each side, and the curved line of the bottom upward,—these lines being equally curved, of course. (Fig. 19.)

"Place the eye above the barrel; the curved line of the bottom inclines upward, and so does the corresponding curve of the top. The top

of the barrel inclines upward, and the bottom inclines still more upward, as they are both horizontal surfaces just as truly when bounded by a circle as by lines at right angles. (Fig. 20.)

“Place your eye exactly on a level with the top of the barrel, and the curved line of the top seems a horizontal line. (Fig. 21.) You may put this fact down in your red book as I give it to you.



FIG. 19.



FIG. 20.

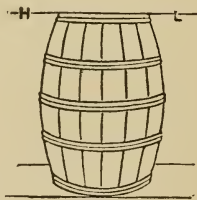


FIG. 21.

“The boundary line of a plane exactly on a level with the eye appears like a straight horizontal line, even though it has actually a curved outline.”

“I told Sammy Bates about seeing two fingers and two knobs, as I did when I was getting measurements,” said Letty, “and he said I could n’t do it anyway, unless I was cross-eyed! He said if he’d been drawing all summer, and

could n't make any better looking pictures than I had in my book, he 'd give up! He said he 'd never believe that the round top of a barrel could look straight if I told him all day."

"You had better not try to teach others till you clearly understand things yourself," I said, laughing, as we put away our paper and pencils.

CHAPTER VIII.

“EVERY object that I have drawn,” said Letty, “has been placed with one of its planes parallel to me; why can’t I sometimes place the object sideways?”

“You can,” said I; “but I wished first to give you a clear idea of Parallel Perspective.”

“Why, am I learning perspective?” cried Letty, with animation; “I didn’t know it, I thought I was only learning drawing! What does perspective mean?”

“It means *looking through*,” said I. “When an object is as correctly drawn as it would be if the outlines of that object were traced on a transparent glass through which we were looking at it, we say, ‘that drawing is in true perspective.’ When a drawing consists only of the outlines of an object, or objects, it is said to be in ‘Linear Perspective.’ *Linear* means line.

“A drawing is said to be in ‘Parallel Perspective’ when one face of the object to be drawn, stands parallel to the person who is drawing it.

“As soon as you can draw correctly in Par-

allel Perspective, I will allow you to draw objects placed 'sideways,' as you call it."

"Is that named 'Sideways Perspective?'" asked Letty.

"No; that is named 'Oblique Perspective.' An object is placed obliquely when no one of its planes is parallel to the person drawing it. We cannot go very deeply into the subject of perspective in these few weeks; but I can give you, in that time, a little practical instruction that will train your eye in drawing from objects, and help you to avoid the mistakes which beginners so often make.

"As I am at leisure now, we will go into the shed-kitchen, where I will tell you a little about Oblique Perspective.

"You may sit down just where you sat to draw the first box in Parallel Perspective." (Fig. 6. — 1.)

"We must chalk in the Horizon Line again, and the Principal Vertical Line," said Letty. "This Centre of View is always on hand, for knots can't fade out of boards, very well."

Before Letty's chair stood the little table and on it the framed glass. I placed the box (that we were about to draw) obliquely, the vertical line common to the two planes which she saw, being directly under the Centre of View, so

that the planes appeared to her of equal width. (Fig. 22. — 1.)

Letty traced the Horizon Line and the Centre of View on the glass with white paint, as before.

"Which line shall I draw first?" she asked.

"Draw the one line which is parallel to you. The middle vertical line which belongs to the two oblique planes is parallel to the Picture Plane, and is the only line which is to be drawn as it is in this picture."

"That is true," she said.

She then traced the outline of the box.

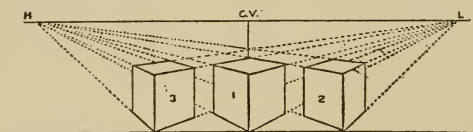


FIG. 22.

"Continue the outlines of the oblique planes, and see where they will meet," I said.

Letty looked up in despair.

"The upper and lower boundary lines of the right-hand side rise and meet on the Horizon Line somewhere off at the right of the Centre of View; and the boundary lines of the left-hand side meet at the left of the Centre of View, — that is, I suppose they do," said Letty; "for lines parallel to each other meet or appear to

meet somewhere, but these lines must run beyond the glass before they can meet."

I laid the framed glass flat on the table, and continued the Horizon Line that was painted on it, on the table in chalk, which made it long enough for the vanishing lines to meet on.

"But they do not meet at any place with a name to it," said Letty. "They have no home to go to, no Centre of View, like lines in Parallel Perspective. They stop just anywhere on the Horizon Line."

"Now, imagine," said I, "the great imaginary Picture Plane, standing upright on its old familiar crack, close against the one vertical line of this box which is parallel to it. (We will suppose the Horizon Line and the Principal Vertical Line to be always marked on the Picture Plane.) On your framed glass you have the very picture which could be traced on the Picture Plane, only smaller, of course.

"Before we go any farther, let us describe the box. You remember in Parallel Perspective that the boundary lines of the horizontal and vertical planes of the box vanished at the point where imaginary planes, parallel to them and running from the eye, intersected each other as they cut through the Picture Plane.

"Let us see if oblique planes and lines will

not fall under the same law. The upper boundary line of the right-hand vertical plane of the box also belongs to the horizontal plane of the top of the box. Must not that line which belongs to two planes vanish at the point where the two imaginary planes, running from the eye and parallel to the two planes to which the line belongs, intersect on the Picture Plane?"

"Yes, it ought to," said Letty; "but how can you tell just where the imaginary oblique planes will cut the horizontal line?"

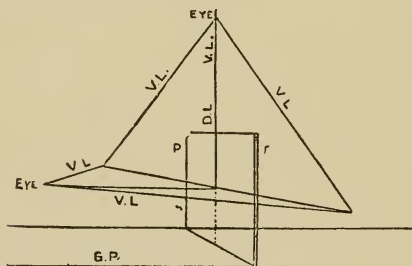


FIG. 23.

"Suppose," said I, "that I had a wire reaching from my eye to the Horizon Line, parallel to the right-hand oblique plane of the box, and another wire reaching from my eye to the Horizon Line, parallel to the left-hand plane of the box. These wires would lie, of course, in two imaginary planes running from my eye parallel to these two planes of the box, and

would therefore be at right angles with each other. As the wires were running straight from my eye to the Horizon Line, they would of course lie in a horizontal plane, parallel with the top of the box.

“The points where these wires touched the Horizon Line would be the vanishing points for the boundary lines of the oblique planes of the box.

“It would be out of the question to have these wires held at my eye. I will therefore use the vanishing points where they touch the Horizon Line as hinges, and turn the wires up against the imaginary Picture Plane. The point where these two wires met at the eye will *now* rest

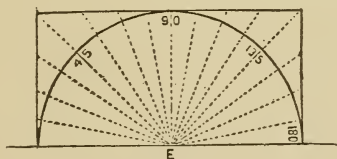


FIG. 24.

on the Principal Vertical Line, as far above the Centre of View as my eye was distant from the Centre of View. This we will call the Distance Line, as it represents the distance of the front line, or front face, of the object and of the imaginary Picture Plane from the eye.” (Fig. 23.)

Letty wondered what was coming next, when I took from my portfolio a piece of thick cardboard, about four and a half inches wide by three inches long, and marked with lines and angles as shown in the diagram. (Fig. 24.)

I held the card out horizontally so that the line from *E* to 90 lay at right angles from me. (If prolonged, that line would have touched the Principal Vertical Line on the Picture Plane.) I laid a pencil on the card, from *E* parallel to the right-hand oblique plane of the box, and noticed the angle the pencil made with the line from *E*. It was an angle of forty-five degrees.

"What is the distance from my eye to the Picture Plane?" I asked.

"Six times the height of the box," replied Letty, who had measured it.

I measured six times the height of the little box in my picture, and on the glass laid this measurement off on the Principal Vertical Line, upward from the Centre of View, and marked it *E*.

Then starting at *E*, I drew a line downward at an angle of forty-five degrees from the Principal Vertical Line and on the right hand side of it. (See Fig. 23.) This downward line is called the Vanishing Line. The point where this downward line cuts the Horizon Line gives the

first Vanishing Point. Then starting once more at *E*, I draw a line downward at right angles with the first Vanishing Line. Where this cuts the Horizon Line is the second Vanishing Point.

"Oh, that is beautiful!" said Letty, clapping her hands; "you just say, 'If this went that way, and that went this way, such and such a thing would happen,' and it always does."

"I will place the box a little to the left (Fig. 22. — 3). Where will the outlines vanish now, if continued?" I asked.

Letty's face brightened, after a moment of thought.

"Would n't it be something like the box in Parallel Perspective, in Figure 6. — 3, the lines of which vanished at the same point with the lines of the box directly in front of me?" she asked.

"Certainly; the same law would govern these lines. The vanishing points would be the same as those of the box you drew before, though you would not see the sides equally, of course. The box is now exactly in the same position, as regards the Picture Plane, as it was before."

"That is splendid!" cried Letty. "Now I'll have a picture of these oblique boxes, just as I have of the parallel ones." (Fig. 22. — 3.)

"You see that you were very much like Sammy Bates, who would not look carefully,

nor find the reason for things, when you said that the boundary lines of oblique planes met *anywhere on the Horizon Line.*"

I heard Letty telling her aunt of this lesson afterward. "Did you know I was studying perspective, Aunt Mercy?" she asked.

"No," she replied, in surprise.

"Well, I am. Perspective comes from two Latin words —"

"Does?" exclaimed the old lady. But I detected an absent tone in her voice, and knew she was meditating on the heel of Uncle Peter's stocking, which was just on the turn.

NOTE. — Cards like that shown in Figure 24, and accurately marked off, may be bought at the stores. They are made of isinglass, and are transparent, so that when the proper angle has been determined, they may be laid face down on the drawing paper, and will then indicate the direction of the line to be drawn.

CHAPTER IX.

I PLACED a box with its middle vertical line under the Centre of View, yet at such an angle that I could see much more of the right-hand plane than of the left.

Letty spread her drawing-paper on the table, and drew on it the Horizon Line, Centre of View, and the Principal Vertical Line, and on the latter she marked off the Distance Line marked *E*.

She drew the vertical line of the box, which was parallel to her, as before, at the proper distance below the Centre of View. The lower edge of the paper represented the edge of the Ground Plane, and was marked "Ground Line."

As Letty held the little card out at arm's length, she looked so wise that I could not help laughing. She laid a pencil on the card at *E*, and moved it till it was exactly parallel to the right-hand oblique plane of the box.

She found on looking at the card, that the side of the box stood at an angle of sixty-five degrees from the imaginary Vertical Plane. She

accordingly drew a line from the *E* on her paper downward at an angle of sixty-five degrees from the Principal Vertical Line and at the right-hand side of it, until it reached the Horizon Line.

She then ruled a line from the same *E*, at right angles to the vanishing line already found; and where it met the Horizon Line she marked the second vanishing point. (Fig. 25.)

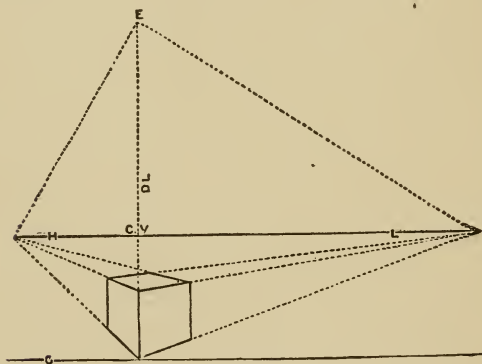


FIG. 25.

"See, Letty," said I, "for every degree that you moved the right-hand plane of the box away from the imaginary Vertical Plane, or Principal Vertical Line, as we say, you moved the left-hand plane as many degrees nearer to it.

"You move the right-hand plane of the box two degrees away from the Vertical Plane; and

as the right angle formed by the planes of the box must be preserved, that forces the left-hand plane of the box two degrees nearer to the Vertical Plane."

"It is just like getting the answer to a puzzle," cried Letty, in delight. "Oh, there is another question: If the planes of a box were not at right angles, how could you find the vanishing points?"

"In exactly the same way, only that as the planes would not be at right angles, you would have to use the card for each side, as each side would vanish in a plane of its own."

I drew objects in different positions, and Letty copied them in her book with the questions she had asked, and the answers I had given to her about them, that she might have them to refer to when I was gone, for my time at the cottage was drawing to a close.

"I wish I could show you a city street or a long avenue in the evening," said I, one day to her. "The street (the Ground Plane) seems to incline upward. The long rows of gaslights on each side appear to incline downward as they recede into the distance, being above my eye; and lying in a vertical side plane they seem, as they appear to draw nearer and nearer together, to become one shining star at the end. (Fig. 26.)

You know how the railroad tracks appear to incline upward, and the telegraph wires downward, till they all seem to meet at a point opposite the eye in the far distance. We noticed it the day we went to the 'Centre.' ”

As Letty and I strolled along the road one day, we came in sight of the village church.

“ It was awful wicked,” said the little girl ; “ but I just *had* to study lines all church time. We sit so far back in the middle aisle that I could

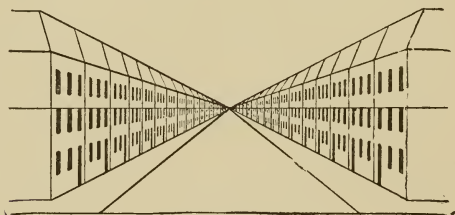


FIG. 26.

see the walls in such a splendid way ! They grew shorter and shorter as they got nearer to the pulpit ; the top lines of the windows on each side inclined down ; and the window-sills inclined upward ; and the windows grew smaller too ; and the lines of the pews inclined up, because they were below the level of my eye ; and the Centre of View came on one of the tassels of the Bible cushion, and I could see that if I drew a line

from the top of the nearest window at my right hand, and another from the top of the nearest one at my left, they would appear to run right down and meet on the cushion tassel. I did the perspective of the pulpit too, and of the table and chairs in front of it." (Fig. 27.)

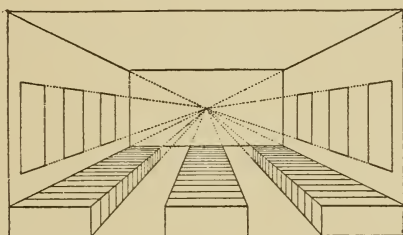


FIG. 27.

I made outline drawings of houses seen from different positions for Letty's book, and wrote these facts concerning them for her, —

1. When the end plane of a house with a "pitched roof" stands parallel to you, the slanting lines of the roof should be drawn as they are, as they do not vanish anywhere. (Fig. 28.)

2. When the ridge-pole and the line of the eaves are parallel to you, the plane of the roof is called an Ascending Plane, and it will vanish above the Horizon Plane, where an imaginary

ascending plane, running from your eye and parallel to it, — that is, parallel to the ascending

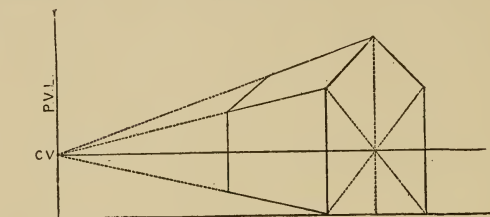


FIG. 28.

plane of the roof, — will cut the *Picture Plane*. (Fig. 29.)

The line No. 1 belongs to the Vertical Plane

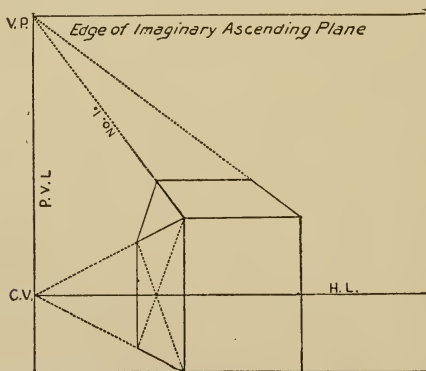


FIG. 29.

of the side of the house, and therefore is forced by that plane toward the Vertical Plane, on

which it must vanish. It cannot vanish at the Centre of View, however, because it does not belong to a Horizontal Plane, but belongs to the ascending plane of the roof, which forces it to vanish at some higher point than the Horizon Plane, — at the point in fact where an imaginary ascending plane, parallel to the roof, intersects the Vertical Plane (the edge of which plane is called the Vertical Line) as it cuts through the Picture Plane on its way into the distance.

The best way, however, for you at present is to find the vanishing point of the side plane of the house, which is at the Centre of View, decide on its apparent width, draw two lines diagonally on it, and from the intersection of these lines draw a long Vertical Line which will determine the centre of the side plane and, of course, the middle point of the roof (as in Fig. 28). Your eye will readily decide on the pitch of the roof with these helps.

So the pleasant summer flew away, and my last day at the cottage came. Aunt Mercy gave me a pin-cushion made of blue-and-green changeable silk. Uncle Peter presented me with a tiny sail-boat, a model of his own large one in which I had had so many pleasant sails. Letty gave me a pair of fine scarlet mittens

which I had supposed she was knitting for herself.

We had dinner that day at eleven o'clock, for Aunt Mercy would not let me go away without *that*.

The stage drove up with a flourish. My trunk was strapped onto the rack. Sammy Bates came out of his house and stood at the door to see the parting, and then followed us to the stage and listened, opened-mouthed, to the last words.

Slam went the door; round went the wheels; and we were off with Sammy hanging on behind, and swinging like a pendulum under the trunk-rack.

The driver gave a shrill whistle as he passed the solitary houses along the road, and little girls in sun-bonnets and old men in their shirt-sleeves ran out at the call for their letters and papers, which he tossed at them without stopping his horses.

The roadside was bright with asters and golden-rod. By the little brook under the bridge, a few cardinal flowers still lingered.

Here and there I caught sight of the tidal river winding among the golden marshes, and bearing its burden of sunbeams to the sea.

Eben was a very accommodating driver. He

said there was plenty of time, — there was always plenty of time for everything in that region, — if I wanted to get out and pick box-berries. I gladly accepted his offer, the mail-bags, meanwhile, waiting my pleasure.

I had a letter, a month or two after this, from Letty, in which she told me that she had drawn an hour every day, and had already made twenty tracings and drawings, that she should like to show me. She said there were two things she should never forget; for she knew them even when she was asleep. The night before she wrote, she had dreamed that Uncle Peter, Aunt Mercy, and Sammy Bates all sat in a row. Uncle Peter got up and said, "A plane vanishes where an imaginary plane from the eye, parallel to it, cuts the Picture Plane."

"A line vanishes where an imaginary line from the eye, parallel to it, pierces the Picture Plane."

And then Aunt Mercy got up and said it; and after that Sammy Bates did the same. Letty wrote that she laughed so hard to think they kept telling her what she knew, and what they didn't know, that she waked from her dream.

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